

**English Translation of the Specification of  
Japanese Patent No 61-106162**

## Appendix II

(19) Japan Patent Office (JP) (12) **Japanese Patent Disclosure Publication (A)**

(11) Japanese Patent Disclosure Publication Number

**61-106162**

(43) Publication Date: May 24, 1986

(51) Int. Cl.<sup>4</sup> Identification Code Internal File No.  
A 61 L 9/01 6779-4C

Request for Examination: Not yet made Number of claims: 1 (Total of 2 pp.)

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Title of Invention: **Deodorant**

(21) Application Number: 59-229636

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### Specifications

1. Title of Invention:

Deodorant

2. Scope of Patent Claims:

Claim 1: A deodorant, comprising an aqueous solution of a bivalent iron salt and at least one compound selected from citric acid, malic acid, tartaric acid, maleic acid, fumaric acid, and their salts, dissolved in an aqueous solvent.

### 3. Detailed Description of the Invention:

This invention concerns a deodorant, the principal ingredient of which is the divalent iron ion.

Deodorants which use the reactivity of the divalent iron ion are already known; for example, deodorants comprising the divalent iron ion and L-ascorbic acid (vitamin C) dissolved in an aqueous solvent are known. However, the L-ascorbic acid used as a stabilizer in this case has the problem that it is expensive.

The inventors performed diligent research to develop an inexpensive stabilizer to replace the L-ascorbic acid used in this case. As a result, they discovered that citric acid, malic acid, tartaric acid, maleic acid, fumaric acid, and their salts are suitable for this purpose, and perfected this invention.

That is, this invention provides a deodorant which comprises an aqueous solution of a bivalent iron salt and at least one compound selected from citric acid, malic acid, tartaric acid, maleic acid, fumaric acid, and their salts, dissolved in an aqueous solvent.

As the bivalent iron salts used in this invention, one can use various ones which are already publicly known; in general, the sulfate, nitrate, or the halides (the chloride, bromide, etc.) are used. On the other hand, as the salts of the aforementioned organic acids which are used in combination with these bivalent iron salts, publicly known ones, e.g., sodium, potassium, or other alkali metal salts are generally used. The proportions in which the aforementioned organic acids or their salts are used are not particularly limited, but at least 5 parts by weight, preferably 10 or more parts by weight, and especially desirably 200-100 parts by weight are used per 100 parts by weight of the bivalent iron salt. As the aqueous solvent, water is ordinarily used; if desired, suitable quantities of ethanol, propanol, or other water-soluble organic solvents can be added. The concentration of the bivalent iron salt in the aqueous solvent is 0.1 wt% or higher, preferably 1 wt% or higher; its upper limit is the solubility of the bivalent iron salt.

The deodorant of this invention can be used in various pH regions, acidic, neutral, or alkaline, by adding pH regulators (e.g., NaOH, NaHCO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, HCl, etc.). In general, deodorants with pH values in the acidic region are used for alkaline odors such as ammonia or amines, and deodorants with pH values in the neutral or alkaline regions are used for hydrogen sulfide or mercaptan odors.

The deodorant of this invention can be used as is, in an aqueous solution, or it can be used as a gel, with a gelling agent added, or it can be impregnated into a

water-absorbent support, e.g., activated carbon, pulp powder, wood powder, sawdust, zeolites, perlite, vermiculite, sepiolite, loess, clay, absorbent cotton, paper, nonwoven fabric, etc.

When the deodorant of this invention comes into contact with odors of ammonia, amines, hydrogen sulfide, mercaptan, etc., under suitable pH conditions, the bivalent iron ion ( $\text{Fe}^{++}$ ) reacts with these odor ingredients and the odors are eliminated.

It is advantageous for the deodorant of this invention to contain a deliquescent substance. In this case, various publicly known deliquescent substances can be used, such as calcium chloride, magnesium chloride, iron chloride, aluminum chloride, potassium hydrogen sulfate, sodium hydrogen sulfate, bittern, raw table salt, etc. The quantity of the deliquescent added is not particularly limited, but in general 0.01–0.5 part by weight, especially 0.05–0.2 part by weight, per 1 part by weight of the bivalent iron salt is used. If the deodorant of this invention is impregnated into a support consisting of a solid substance, this deliquescent can suppress the transpiration of water and prevent the drying of the bivalent iron salt after the water has transpired; it has the effect of giving moisture to the bivalent iron salt and maintaining the reactivity of the bivalent iron salt.

Next, this invention will be explained in further detail by means of working examples.

In order to observed the stabilizing effect of the organic acid or its salt on the bivalent iron ion, 0.5 g of various organic acids or their salts were added to 10 cc of a 10 wt% aqueous solution of ferrous sulfate heptahydrate ( $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ ) to make sample aqueous solutions, these solutions were left standing for one month, and the presence or absence of a precipitate was then checked. The results are shown in the following table.

Table 1

Sample No.	Organic acid or its salt	Presence or absence of precipitate
1	3Na citrate $\cdot 2\text{H}_2\text{O}$	Absent
2	Citric acid	"
3	Sodium malate	"
4	Tartaric acid	"
5	Maleic acid	"
6	Fumaric acid	"
7*	–	Yes

\* Comparison example

## *Appendix II*

From the results shown in Table 1 above, it can be seen that the aqueous solutions of this invention are clearly stabilized.

### Working Example 2

A solution was made by adding 5 parts by weight 3Na citrate  $2\text{H}_2\text{O}$ , 10 parts by weight ferrous sulfate heptahydrate, and 3 parts by weight crude table salt to 100 parts by weight water and dissolving them homogeneously. Five cubic centimeters of this solution were added to 20 g fine calcined vermiculite powder and mixed thoroughly to impregnate the solution. The result was sealed into an air-permeable bag (8 x 6 cm) to make the product.

Next, one of two products obtained in this way was put into a polyethylene bag with a volume of approximately 1200 cc and a filter paper impregnated with 0.5 cc ammonia was also put into the bag; the bag was then tightly sealed. Moreover, the other product was put into a polyethylene bag with a volume of approximately 1200 cc in the same way and a quantity of hydrogen sulfide gas such that its odor could be perceived was also put into the bag; the bag was then tightly sealed. These bags were left for 18 hours, after which they were opened and the odors in them were investigated. It was found that no odor could be perceived in either bag.